

Notice of Allowability

Application No.

10/764,941

Examiner

Roberto Rábago

Applicant(s)

NAGY, SANDOR

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☐ This communication is responsive to ____.
2. ☒ The allowed claim(s) is/are 1 and 3-19.
3. ☐ The drawings filed on ____ are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: ____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
 6. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date ____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date ____.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 4/26/04
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date ____
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other ____.

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Examiner's Amendment

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Jonathan Schuchardt on 6/20/2005.

In the claims:

Cancel claims 2, 20 and 21.

Replace claims 1 and 3 with the following amended versions:

1. (currently amended) A process which comprises polymerizing an olefin in the presence of: (a) a single-site or Ziegler-Natta olefin polymerization catalyst; (b) a low-temperature, ~~platinum-group~~ dehydrogenation catalyst comprising a metal selected from the group consisting of platinum, palladium, rhodium, ruthenium, osmium, iridium, nickel, and rhenium; and (c) an optional hydrocarbon solvent, under conditions effective to promote:
 - (i) olefin polymerization;
 - (ii) catalytic dehydrogenation of the solvent and/or the resulting saturated oligomer or polymer chains to produce short and/or long-chain alkenes; and
 - (iii) copolymerization of additional olefin with the alkenes; to produce a polyolefin having long-chain branching and/or a density less than about 0.96 g/cm³.
3. (currently amended) The process of claim ~~2~~ 1 wherein the ~~transition metal is~~ dehydrogenation catalyst comprises iridium.

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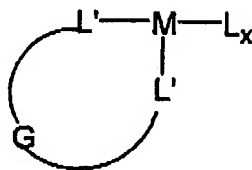
In the Specification:

Please replace the first paragraph on page 6 with the following amended paragraph:

The olefin polymerization catalyst can be any catalyst system that polymerizes olefins, including Ziegler-Natta or single-site catalysts. Preferably, the olefin polymerization catalyst is a single-site catalyst which comprises an activator and an organometallic complex, wherein the organometallic complex comprises a Group 3 to 10 transition metal and at least one polymerization-stable anionic ligand bonded to the transition metal. The polymerization-stable anionic ligand is preferably selected from the group consisting of cyclopentadienyl, indenyl, fluorenyl, and indenoindolyl ligands. More preferred complexes include a Group 4 transition metal such as titanium or zirconium. Preferably, the organometallic complex has open architecture. When the organometallic complex has open architecture, preferably it has the general structure:

Please insert the following two new paragraphs immediately below the structures on page 7:

Preferably, the organometallic complex has the structure:

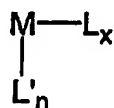


wherein M is a Group 3 to 10 transition metal; each L is independently selected from the group consisting of halide, alkoxy, aryloxy, siloxy, alkylamino, and C₁-C₃₀ hydrocarbyl; each L' is independently selected from the group consisting of alkylamido, substituted or unsubstituted cyclopentadienyl, fluorenyl, indenyl, boraaryl, pyrrolyl, azaboroliny, and indenoindolyl; G is a linking group and x satisfies the valence of M.

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Preferably, G is a divalent radical selected from the group consisting of hydrocarbyl and heteroatom-containing alkylene radicals, diorganosilyl radicals, diorganogermanium radicals, and diorganotin radicals. Preferably, one L' is alkylamido and the other L' is selected from the group consisting of substituted or unsubstituted cyclopentadienyl, fluorenyl, indenyl, and indenoindolyl.

In another preferred aspect, the organometallic complex has the general structure:



wherein M is a Group 3 to 10 transition metal; each L is independently selected from the group consisting of halide, alkoxy, aryloxy, siloxy, alkylamino, and C₁-C₃₀ hydrocarbyl; each L' is independently selected from the group consisting of alkylamido, substituted or unsubstituted cyclopentadienyl, fluorenyl, indenyl, boraaryl, azaborolynyl, and indenoindolyl; n is 1 or 2 and x satisfies the valence of M.

Please replace the paragraph bridging pages 7-8 with the following amended paragraph:

The activator helps to ionize the organometallic complex and activate the catalyst. Suitable activators are well known in the art. Examples include alumoxanes (methyl alumoxane (MAO), PMAO, ethyl alumoxane, diisobutyl alumoxane), alkylaluminum compounds (triethylaluminum, diethyl aluminum chloride, trimethylaluminum, triisobutyl aluminum), and the like. Suitable activators include acid salts that contain non-nucleophilic anions. These compounds generally consist of bulky ligands attached to boron or aluminum, and particularly include ionic borates and ionic aluminates. Examples include lithium tetrakis(pentafluorophenyl)borate, lithium tetrakis(pentafluorophenyl)-

aluminate, anilinium tetrakis(pentafluorophenyl)borate, trityl tetrakis(pentafluorophenyl)borate, and the like. Suitable activators also include organoboranes, which include boron and one or more alkyl, aryl, or aralkyl groups. Suitable activators include substituted and unsubstituted trialkyl and triarylboranes such as tris(pentafluorophenyl)borane, triphenylborane, tri-n-octylborane, and the like. These and other suitable boron-containing activators are described in U.S. Pat. Nos. 5,153,157, 5,198,401, and 5,241,025, the teachings of which are incorporated herein by reference. Suitable activators also include aluminoboronates—reaction products of alkyl aluminum compounds and organoboronic acids—as described in U.S. Pat. Nos. 5,414,180 and 5,648,440, the teachings of which are incorporated herein by reference. Alumoxane activators, such as MAO, are preferred.

Please replace the first paragraph on page 9 with the following amended paragraph:

Preferred olefins for the polymerization are ethylene and C₃-C₂₀ α-olefins such as propylene, 1-butene, 1-pentene, 1-hexene, 1-octene, and the like. Mixtures of olefins can be used. Ethylene and mixtures of ethylene with C₃-C₁₀ α-olefins are especially preferred.

Please replace the third paragraph on page 9 with the following amended paragraph:

The polymerizations can be performed over a wide temperature range, such as about -30°C to about 280°C. A more preferred range is from about 30°C to about 180°C; most 250°C, even more preferably from about 30°C to about 160°C. Most preferred is the range from about 60°C to about 100°C. Olefin partial pressures normally range from about 0.1 MPa to about 350 MPa. More preferred is the range from about 0.1 MPa to about 7 MPa.

Reasons for Allowance

2. The following is an examiner's statement of reasons for allowance. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

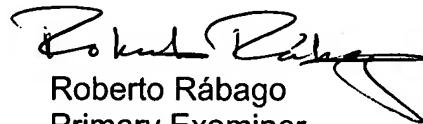
The prior art has established that transition metal pincer complexes are effective dehydrogenation catalysts for the conversion of alkanes to alkenes (C. Jensen, Chem. Commun. 1999). Also recognized is the usefulness of using a two-catalyst system for olefin copolymerization comprising a first catalyst for in-situ generation of comonomers and a second catalyst for copolymerization of the olefins with the comonomers (US 6,586,541). However, the prior art cited on this record has not disclosed a process of olefin copolymerization wherein polymerization occurs in the presence of a dehydrogenation catalyst producing alkene, and a copolymerization catalyst which produces copolymer from the olefin and the alkene produced by dehydrogenation.

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberto Rábago whose telephone number is (571) 272-1109. The examiner can normally be reached on Monday - Friday from 8:00 - 4:00.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on (571) 272-1114. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Roberto Rábago
Primary Examiner
Art Unit 1713

RR
June 20, 2005